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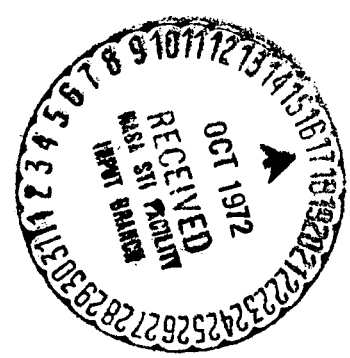


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# DETERMINATION OF THE VISUAL AND TRUE COLORS OF NOCTILUCENT CLOUDS

by

V. V. Sharonov

As is already known, noctilucent clouds appear to be light blue to the eye of the observer. This was objectively supported by the spectrophotometric observations of N. I. Grishin (VAGO [All-Union Astronomical and Geodetic Society] Bulletin No 19 (26), pp 3-16). For the study of this question by means of visual colorimetry during appearance of bright noctilucent clouds present on 15-16 July 1959, a Rosenberg astrophotometer installed on an "Assembi" telescope was used at the Atmosphere-Optical Station of the AOLGU [Astronomical Observatory of the Leningrad State University] in the city of Petrodvorets. By means of the blue wedge of this instrument, the visible color of three bright parts of a cloud system was measured, along with that of the cloudless sky background adjacent to it. The result of the measurement was expressed in the form of a visible index of yellowness D, i.e. the difference between the index of the color of a cloud observed through the earth's atmosphere together with the light of the twilight sky imposed on it, and the index of the extra-atmospheric light of the sun, which was arbitrarily used as the standard of white light. The results attained were the following:

| Hour (Decrement of Rotation of the Third Field) | Object | Coordinates A (fr. S to W) | h | D | $D_o$ |
|---|---|---|---|---|---|
| $1^h00^m$ | Bright Field | 170° | 7.5° | -0.32 | -1.14 |
| 1 20 | Bright Cluster | 179° | 10.9° | -0.34 | -0.86 |
| 1 54 | Bright Cluster | 180° | 14.3° | -0.42 | -1.00 |

The negative values of parameter D show that the visible color of noctilucent clouds is indeed light blue, and its intensity grows with increased height h of the cloud above the horizon. The latter is a natural consequence of the selective action of atmospheric extinction.

Measuring the value of brightness of a noctilucent cloud and its sky background, measured with the same instrument in a visual light system, it is possible, using values D for sky light, to attain the true index of yellowness $D_o$, which represents the difference between the index of color emission of a cloud freed from the effect of atmospheric extinction and the diffused background of the sky, and that of extra-atmospheric sunlight. The values of $D_o$ received show that the true color of noctilucent clouds is significantly bluer than the visible one, in that the index of color for an emission diffused in a cloud is a full value less than that for the sun rays illuminating the cloud.

We notice that for a stream of rays diffused according to Rayleigh's law $\lambda^{-4}$, the value of $D_o$ will be -1.25 if the theoretical values of 560 and 420 mμ are used for the effective wave lengths of the visual and photographic systems; and if the values $\lambda$ = 529 and 425 mμ, corresponding to the Harvard system are used, $D_o$ = -0.95. For bluer sections of cloudless daytime sky, measurements yield a value of D within limits of from -1.0 to -1.2. Therefore, it can be stated that the color of beams which are diffused by the substance of a noctilucent cloud is close to both the color of a clear daytime sky and that of beams diffused according to Rayleigh's law.

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